PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-138150
(43)Date of publication of application : 14.05.2002

(51)Int.Cl. C08J 5/18
B32B 27/36
C08K 3/00
C08K 3/22
C08K 5/00
C08L 67/02
G02B 1/04
G02B 5/02
G02F 1/13357

(21)Application number : 2000-335917
(22)Date of filing : 02.11.2000

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(54) WHITE POLYESTER FILM

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a white polyester film for liquid crystal display reflection panel suitable for use as a substrate for liquid crystal display reflection panel which gives brighter screen and higher reflection rate using titanium oxide.
SOLUTION: This white polyester film comprises 15 to 40 wt.% of titanium oxide having an average particle size of 0.1 to 0.5 μm, with 3 to 25% void rate, and is characterized in that an average reflection rate of light in the range of 400 to 700 nm wave length is 90% or more and a reflection rate of light at 390 nm wave length is 75% or more.

CLAIMS

[Claim(s)]
[Claim 1]A white polyester film which contains titanium oxide with a mean particle diameter of 0.1-0.5 micrometer 15 to 40% of the weight, and is characterized by reflectance in wavelength of light whose average reflectance in a wavelength band of light whose void fractions are 3 to 25% and 400-700 nm is not less than 90% and 390 nm being not less than 75%.
[Claim 2]The white polyester film according to claim 1 which contains a fluorescent brightener 0.01 to 0.2% of the weight further in addition to titanium oxide.
[Claim 3]The white polyester film according to claim 1 or 2 which contains particles other than titanium oxide 5 or less % of the weight further in addition to titanium oxide.
[Claim 4]The white polyester film according to claim 1 which laminated a layer which consists of polyester which contains a lubricant particle 0.01 to 10% of the weight to one side or both sides of a white polyester film.
[Claim 5]The white polyester film according to claim 1 which laminated a coating layer to one side or both sides of a white polyester film.
[Claim 6]The white polyester film according to any one of claims 1 to 5 used as a liquid crystal display light reflector substrate.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention about a white polyester film about the optimal white polyester film for the detailed substrate for light reflectors for liquid crystal displays, When a liquid crystal display is illuminated in a light in more detail, it is related with the white polyester film used for the liquid crystal display light reflector which can constitute the substrate for light reflectors with which a brighter screen is obtained.
[0002]
[Description of the Prior Art]When illuminating a liquid crystal display, the back light method which applies a light from the back of a display was adopted conventionally, but a side light system as shown in JP,63-62104,A has come to be widely used in recent years from the merit which can be uniformly illuminated with a thin shape. A side light system is a method illuminated using a cold cathode tube etc. from edge, such as an acrylic board with a certain thickness. According to this method, the illumination light is uniformly distributed by halftone dot printing provided in the inside of a liquid crystal display, and there is an advantage from which a screen with a uniform luminosity is obtained. In order to install lighting in the edge part instead of the back of a screen, there is also an advantage made to a thin shape from a back light method. In order to prevent the escape on the back of a screen of the illumination light inside a liquid crystal display, the light reflector is installed in the back of a screen. In this composition, in order to obtain a brighter screen, the high reflexivity of light is required as thin film-ization of a light reflector.
[0003]Although the method of for example making the ease of workability and titanium oxide since it is cheap contain is mentioned as a white polyester film for liquid crystal display light reflectors in alignment with this purpose, There was a limit in improvement in reflectance only by addition of titanium oxide etc. as indicated to JP,8-16175,B, and there was a problem that the luminosity of a screen was not enough.
[0004]
[Problem(s) to be Solved by the Invention]Even if this invention solves this problem and titanium oxide is used for it, it is high reflectance more, and an object of this invention is to use for the substrate for liquid crystal display light reflectors with which a brighter screen is obtained, and to provide the optimal white polyester film for liquid crystal display light reflectors.
[0005]
[Means for Solving the Problem]This invention persons reached this invention, as a result of inquiring wholeheartedly that the aforementioned white polyester film for liquid crystal display light reflectors should be developed. Namely, this invention contains titanium oxide with a mean particle diameter of 0.1-0.5 micrometer 15 to 40% of the weight, A void fraction is a white polyester film, wherein reflectance in wavelength of light whose average reflectance in a wavelength band of light which is 400-700 nm is not less than 90% and 390 nm is not less than 75% 3 to 25%.
[0006]As for a white polyester film of this invention, it is preferred to take the following modes.
1. In addition to titanium oxide, contain a fluorescent brightener 0.01 to 0.2% of the weight

further.
2. In addition to titanium oxide, contain particles other than titanium oxide 5 or less % of the weight further.
3. Laminate a layer which consists of polyester which contains a lubricant particle 0.01 to 10% of the weight to one side or both sides of a white polyester film.
4. Laminate a coating layer to one side or both sides of a white polyester film.
[0007]
[Embodiment of the Invention]Hereafter, this invention is explained in detail.
[0008]As polyester which constitutes the film of polyester this invention, Are diol and dicarboxylic acid polymer produced by making carry out a polycondensation reaction, and as dicarboxylic acid, For example, terephthalic acid, isophthalic acid, 2,6-naphthalene dicarboxylic acid, 4,4'-diphenyldicarboxylic acid, adipic acid, sebacic acid, etc. are used preferably, and with diol. For example, ethylene glycol, 1,4-butanediol, 1, 4-cyclohexane dimethanol, 1,6-hexanediol, etc. are used preferably. Polyethylene terephthalate and especially polyethylene 2,6-naphthalene dicarboxylate are preferred in these. These polyester may be gay polyester or may be copolymerized polyester. As a copolymer component, for example A diethylene glycol, neopentyl glycol, Dicarboxylic acid components, such as diol components, such as polyalkylene glycol, adipic acid, sebacic acid, phthalic acid, isophthalic acid, 2,6-naphthalene dicarboxylic acid, and 5-sodium sulfoisophtharate, are raised.
[0009]In this polyester, various publicly known additive agents, for example, an antioxidant, a spray for preventing static electricity, etc. may be added. As polyester in this invention, polyethylene terephthalate is preferred. Polyethylene terephthalate is excellent in a water resisting property, endurance, chemical resistance, etc.
[0010]the white film of addition particle this invention -- a titanium oxide particle with a mean particle diameter of 0.1-0.5 micrometer -- 15 to 40 % of the weight -- desirable -- 20 to 35 % of the weight -- range content is carried out. If content is less than 15 % of the weight, the average reflectance in the wavelength band of 400-700-nm light will not reach to 90%, but if it, on the other hand, exceeds 40 % of the weight, it will become the ductile inferior thing and the productive efficiency at the time of film film production will get remarkably bad.
[0011]As for the white film of this invention, it is preferred to contain particles other than titanium oxide 5 or less % of the weight. If it exceeds 5 % of the weight, ductility will be inferior and it will become what has bad productivity. As the above-mentioned particles, in order not to bar the effect of a fluorescent brightener, particles without the absorption of light are preferred. The particles which a void tends to form are more preferred. Inactive inorganic particles, such as silica, calcium carbonate, alumina, calcium phosphate, talc, clay, and barium sulfate, silicone, bridge construction polystyrene, and organic particles like styrene divinylbenzene copolymer can be preferably mentioned as these particles.
[0012]As for a titanium oxide particle and particles other than titanium oxide, before carrying out addition content to polyester, it is preferred to use a refinery process and to perform particle diameter control and coarse particle removal. As an industrial means of a generation process, a jet mill, a ball mill, etc. are mentioned as a grinding means, and dry type or a wet centrifuge is mentioned as a classification method. These means may combine two or more sorts, and, of course, it may refine gradually.
[0013]Various kinds of methods can be used as a method of making polyester containing particles. The following methods can be mentioned as the typical method.
(a) How to add before addition or a polycondensation reaction start before the ester exchange reaction at the time of polyester synthesis, or the end of an esterification reaction.
(b) How to add and carry out melt kneading to polyester.
(c) How to manufacture the master pellets which carried out abundant addition of titanium oxide or other lubricant in the method of the above-mentioned (a) and (b), to knead with the polyester which does not contain these additive agents, and to make the additive of the specified quantity contain.
[0014]When using the method of adding at the time of the polyester synthesis of said (a), adding to the system of reaction is preferred as a slurry which distributed particles to glycol.

[0015]As for the polyester film of polyester film this invention, it is preferred that a void fraction is 3 to 20% of range preferably 2.5 to 25%. a void fraction -- the numerousness of the voids (opening) in a film -- a table -- the light which is a thing in the bottom and entered into the film by existence of this void causes reflection by the interface of film polymer and air, and is presumed to bring an effect to improvement in the reflectance of a film. If a void fraction is less than 3%, the average reflectance in the wavelength band of 400-700-nm light will fall, on the other hand, extension of a film becomes difficult and, as for the thing exceeding 25%, productive efficiency gets remarkably bad.
[0016]In order to make a void form in the inside of a film, immiscible polymer of a high-melting point is finely distributed in a film base material, for example, polyester, and it is attained by extending it. Although one axis may be sufficient as extension, it is biaxial stretching preferably. When extending, a void is formed in the circumference of an immiscible polymer particle, and it becomes possible to obtain high reflectance more. As immiscible polymer, the Polly 3-methylbutene 1, the Polly 4-methylpentene- 1, polyvinyl t-butane, 1,4-Torrance Polly 2,3-dimethylbutadiene, polyvinyl cyclohexane, Polystyrene, polymethylstyrene, polydimethylstyrene, polyfluorostyrene, Polly 2-methyl-4-fluorostyrene, polyvinyl t-butyl ether, cell roll triacetate, cell roll tripropionate, polyvinyl fluoride, polychlorotrifluoroethylene resin, etc. are mentioned. Especially, polyolefine, especially the Polly 4-methylpentene- 1 are preferred.
[0017]Void means forming other than the above may be used. For example, the foaming agent which consists of carbonate, such as sodium carbonate and potassium carbonate, is added, The method (JP,58-50624,B) of carrying out foamed type nature, and citrate, Triethyl citrate, sodium acid citrate, calcium citrate, tricarballylic acid, Sodium tricarballylic acid, calcium tricarballylic acid, ethane tricarboxylic acid triethyl, Sodium ethanetricarboxylate, methane tricarboxylic acid triethyl, It is sodium methanetricarboxylate, butane tricarboxylic acid triethyl, and sodium butanetricarboxylate, butanetetracarboxylic acid, etc., and two or more these foaming agent independent or these foaming agents may be mixed. The Ca salt of the aliphatic monocarboxylic acid whose carbon number a foaming auxiliary may be added if needed and is ten or more as a foaming auxiliary, The compound chosen from the group which consists of ester of the aliphatic monocarboxylic acid Zn salt, Mg salt, Na salt, aluminum salt, Pb salt, Mn salt, and whose carbon number are ten or more is preferred, and may use together two or more sorts of these foaming auxiliaries. The addition of a foaming auxiliary is a grade which does not influence the physical properties of a film, and its 0.01 to 5 % of the weight is preferred.
[0018]The uniform mixture of polyethylene terephthalate and polycarbonate is heated in temperature of 250-350 **, It may be made to react, it may maintain at the cooking temperature until CO_2 separates, and the method (JP,47-38875,B) of expanding a reaction mixture after that or the physical foam means which adds water addition and a super-seaside fluid to melting polymer may be used.
[0019]The film of this invention may be a monolayer film and may be a laminated film. As a laminated film, the composition which laminated the layer which consists of polyester is preferably mentioned to one side or both sides of a white polyester film. As for the layer which consists of said polyester, it is preferred to contain a lubricant particle 0.01 to 10% of the weight. The kind and mean particle diameter of a lubricant particle apply to particles other than the above-mentioned titanium oxide correspondingly.
[0020]10-300 micrometers of thickness [12-250 micrometers of] of the film of this invention are 13-188 micrometers still more preferably preferably on the whole. In the case of a laminated film, the thickness ratio of each class has the preferred range of (layer which consists of polyester)/(white polyester film layer) =0.01 - 3.
[0021]the polyester film of fluorescent brightener this invention -- a fluorescent brightener -- 0.01 to 0.2% of the weight of the range -- 0.01 to 0.1% of the weight of the thing being done for range content is preferably preferred. As a kind of fluorescent brightener, alumnus-1 (made in Eastman), Uvitex-MD (made by Ciba-Geigy), JP-Conc (made by Nippon Chemical Works), etc. are raised.
[0022]In less than 0.01 % of the weight, the addition of a fluorescent brightener does not become

what has enough illumination, when the reflectance of the wavelength band of 390-nm light considers it as the circumference light reflector of lower from the above-mentioned reflectance. If it exceeds 0.2 % of the weight, since the characteristic color which a fluorescent brightener has appears, it is not desirable.

[0023]It is preferred to provide a coating layer in one side or both sides of a white film of coating layer this invention. A coating layer is provided in order to improve the adhesive property of the white film of this invention, and the liquid crystal display parts pasted together, and the resin which does easy adhesiveness so can be used for it as the ingredient. As this resin, various resin of thermoplastics or thermosetting resin can use it. For example, they are polyester, polyamide, polyester amide, polyvinyl chloride, poly(meta) acrylic ester, polyurethane, polyvinyl chloride, polystyrene, polyolefines, these copolymers, and mixed material. Polyester, poly(meta) acrylic ester, and polyurethane are especially preferred. What added the cross linking agent and constructed the bridge may be used. As a solvent of a coating ointment, an organic solvent and mixtures, such as toluene, ethyl acetate, and methyl ethyl ketone, can be used, and also it is good also considering water as a solvent.

[0024]The coat which makes copolyester, polyalkylene oxide, and particles polyester film with the main ingredients in this invention may be laminated to one side or both sides of the outermost layer.

[0025]As an ingredient which forms a coat in this invention, other resin, such as melamine resin, a spray for preventing static electricity, colorant, a surface-active agent, etc. can be used in addition to the above-mentioned ingredient.

[0026]After applying the solution which contains the ingredient which forms a coat in the polyester film which can be extended, for example as a formation method of the above-mentioned coating layer, it can laminate by drying and extending and heat-treating if needed. The solids concentration of this solution is usually 30 or less % of the weight, and its 10 or less % of the weight is still more preferred.

[0027]The polyester film in which the above-mentioned extension is possible is unextended polyester film, uniaxial-stretching polyester film, or a biaxially oriented polyester film. Especially the vertical extension polyester film that carried out uniaxial stretching to the extruding direction (lengthwise direction) of this inner film is preferred.

[0028]When applying solution to polyester film, if it carries out by the usual coating process, i.e., the process separated from the manufacturing process of this film to the polyester film which carried out biaxial-stretching heat setting, it is easy to involve in dust, dust, etc. and is not desirable. Spreading in an atmosphere cleaner than this viewpoint, i.e., spreading by the manufacturing process of a film, is preferred. And according to this spreading, the adhesion to the polyester film of a coat improves further.

[0029]As a coating method, the publicly known arbitrary methods of spreading are applicable. for example, the roll coat method, the gravure coating method, the roll brush method, a spray coating method, the air knife coat method, the impregnating method, the curtain coat method, etc. -- it can be independent, or it can combine and can use. As for coverage, per [it is running / 0.5-20g] 1 m of film ^{2}, and also 1-10g are preferred. As for aquosity liquid, it is preferred to use as a water dispersion or emulsified liquid.

[0030]The polyester film of manufacturing method this invention of a film can be manufactured using the film production method known from the former, such as the tenter method and a tubular film process. The biaxial-stretching method using the tenter as an example is explained below.

[0031]That is, the polyester composition containing a desired ingredient is heated, melt kneading is carried out with an extruder, it extrudes on the cooling drum which rotates from a slit shape die, and an unextended sheet is fabricated. This is succeedingly heated with roll heating, infrared heat, etc., it extends to a lengthwise direction, and a vertical oriented film is obtained. It is preferred to perform this extension using the peripheral speed difference of two or more rolls. As for extension temperature, it is preferred to consider it as a temperature higher than the glass transition point (Tg) of polyester and also a temperature higher 20-40 ** than Tg. Although draw

magnification is based also on the demand characteristics of this use, it is preferred that it takes 2.5 or more times for 4.0 or less times. It is preferred preferably that it takes 2.8 or more times for 3.9 or less times. When the thickness spots of a film will worsen and a good film will not be obtained, if it is 2.5 or less times, but it is 4.0 or more times, it becomes easy to generate a fracture and there is a problem during film production.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL FIELD

[Field of the Invention]This invention about a white polyester film about the optimal white polyester film for the detailed substrate for light reflectors for liquid crystal displays, When a liquid crystal display is illuminated in a light in more detail, it is related with the white polyester film used for the liquid crystal display light reflector which can constitute the substrate for light reflectors with which a brighter screen is obtained.

[Translation done.]

PRIOR ART

[Description of the Prior Art]When illuminating a liquid crystal display, the back light method which applies a light from the back of a display was adopted conventionally, but a side light system as shown in JP,63-62104,A has come to be widely used in recent years from the merit which can be uniformly illuminated with a thin shape. A side light system is a method illuminated using a cold cathode tube etc. from edge, such as an acrylic board with a certain thickness. According to this method, the illumination light is uniformly distributed by halftone dot printing provided in the inside of a liquid crystal display, and there is an advantage from which a screen with a uniform luminosity is obtained. In order to install lighting in the edge part instead of the back of a screen, there is also an advantage made to a thin shape from a back light method. In order to prevent the escape on the back of a screen of the illumination light inside a liquid crystal display, the light reflector is installed in the back of a screen. In this composition, in order to obtain a brighter screen, the high reflexivity of light is required as thin film-ization of a light reflector.
[0003]Although the method of for example making the ease of workability and titanium oxide since it is cheap contain is mentioned as a white polyester film for liquid crystal display light reflectors in alignment with this purpose, There was a limit in improvement in reflectance only by addition of titanium oxide etc. as indicated to JP,8-16175,B, and there was a problem that the luminosity of a screen was not enough.

EFFECT OF THE INVENTION

[Effect of the Invention]According to this invention, even if it uses titanium oxide, it becomes possible to use for the substrate for liquid crystal display light reflectors with which a brighter screen is obtained, and to obtain the optimal white polyester film for liquid crystal display light reflectors with high reflectance, more, and the industrial value is high.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]Even if this invention solves this problem and titanium oxide is used for it, it is high reflectance more, and an object of this invention is to use for the substrate for liquid crystal display light reflectors with which a brighter screen is obtained, and to provide the optimal white polyester film for liquid crystal display light reflectors.

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MEANS

[Means for Solving the Problem]This invention persons reached this invention, as a result of inquiring wholeheartedly that the aforementioned white polyester film for liquid crystal display light reflectors should be developed. Namely, this invention contains titanium oxide with a mean particle diameter of 0.1-0.5 micrometer 15 to 40% of the weight, A void fraction is a white polyester film, wherein reflectance in wavelength of light whose average reflectance in a wavelength band of light which is 400-700 nm is not less than 90% and 390 nm is not less than 75% 3 to 25%.
[0006]As for a white polyester film of this invention, it is preferred to take the following modes.
1. In addition to titanium oxide, contain a fluorescent brightener 0.01 to 0.2% of the weight further.
2. In addition to titanium oxide, contain particles other than titanium oxide 5 or less % of the weight further.
3. Laminate a layer which consists of polyester which contains a lubricant particle 0.01 to 10% of the weight to one side or both sides of a white polyester film.
4. Laminate a coating layer to one side or both sides of a white polyester film.
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[Embodiment of the Invention]Hereafter, this invention is explained in detail.
[0008]As polyester which constitutes the film of polyester this invention, Are diol and dicarboxylic acid polymer produced by making carry out a polycondensation reaction, and as dicarboxylic acid, For example, terephthalic acid, isophthalic acid, 2,6-naphthalene dicarboxylic acid, 4,4'-diphenyldicarboxylic acid, adipic acid, sebacic acid, etc. are used preferably, and with diol. For example, ethylene glycol, 1,4-butanediol, 1, 4-cyclohexane dimethanol, 1,6-hexanediol, etc. are used preferably. Polyethylene terephthalate and especially polyethylene 2,6-naphthalene dicarboxylate are preferred in these. These polyester may be gay polyester or may be copolymerized polyester. As a copolymer component, for example A diethylene glycol, neopentyl glycol, Dicarboxylic acid components, such as diol components, such as polyalkylene glycol, adipic acid, sebacic acid, phthalic acid, isophthalic acid, 2,6-naphthalene dicarboxylic acid, and 5-sodium sulfoisophtharate, are raised.
[0009]In this polyester, various publicly known additive agents, for example, an antioxidant, a spray for preventing static electricity, etc. may be added. As polyester in this invention, polyethylene terephthalate is preferred. Polyethylene terephthalate is excellent in a water resisting property, endurance, chemical resistance, etc.
[0010]the white film of addition particle this invention -- a titanium oxide particle with a mean particle diameter of 0.1-0.5 micrometer -- 15 to 40 % of the weight -- desirable -- 20 to 35 % of the weight -- range content is carried out. If content is less than 15 % of the weight, the average reflectance in the wavelength band of 400-700-nm light will not reach to 90%, but if it, on the other hand, exceeds 40 % of the weight, it will become the ductile inferior thing and the productive efficiency at the time of film film production will get remarkably bad.
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bar the effect of a fluorescent brightener, particles without the absorption of light are preferred. The particles which a void tends to form are more preferred. Inactive inorganic particles, such as silica, calcium carbonate, alumina, calcium phosphate, talc, clay, and barium sulfate, silicone, bridge construction polystyrene, and organic particles like styrene divinylbenzene copolymer can be preferably mentioned as these particles.

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(c) How to manufacture the master pellets which carried out abundant addition of titanium oxide or other lubricant in the method of the above-mentioned (a) and (b), to knead with the polyester which does not contain these additive agents, and to make the additive of the specified quantity contain.

[0014]When using the method of adding at the time of the polyester synthesis of said (a), adding to the system of reaction is preferred as a slurry which distributed particles to glycol.

[0015]As for the polyester film of polyester film this invention, it is preferred that a void fraction is 3 to 20% of range preferably 2.5 to 25%. a void fraction -- the numerousness of the voids (opening) in a film -- a table -- the light which is a thing in the bottom and entered into the film by existence of this void causes reflection by the interface of film polymer and air, and is presumed to bring an effect to improvement in the reflectance of a film. If a void fraction is less than 3%, the average reflectance in the wavelength band of 400-700-nm light will fall, on the other hand, extension of a film becomes difficult and, as for the thing exceeding 25%, productive efficiency gets remarkably bad.

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[0018]The uniform mixture of polyethylene terephthalate and polycarbonate is heated in temperature of 250-350 **, It may be made to react, it may maintain at the cooking temperature until CO_2 separates, and the method (JP,47-38875,B) of expanding a reaction mixture after that or the physical foam means which adds water addition and a super-seaside fluid to melting polymer may be used.
[0019]The film of this invention may be a monolayer film and may be a laminated film. As a laminated film, the composition which laminated the layer which consists of polyester is preferably mentioned to one side or both sides of a white polyester film. As for the layer which consists of said polyester, it is preferred to contain a lubricant particle 0.01 to 10% of the weight. The kind and mean particle diameter of a lubricant particle apply to particles other than the above-mentioned titanium oxide correspondingly.
[0020]10-300 micrometers of thickness [12-250 micrometers of] of the film of this invention are 13-188 micrometers still more preferably preferably on the whole. In the case of a laminated film, the thickness ratio of each class has the preferred range of (layer which consists of polyester)/(white polyester film layer) =0.01 - 3.
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[0022]In less than 0.01 % of the weight, the addition of a fluorescent brightener does not become what has enough illumination, when the reflectance of the wavelength band of 390-nm light considers it as the circumference light reflector of lower from the above-mentioned reflectance. If it exceeds 0.2 % of the weight, since the characteristic color which a fluorescent brightener has appears, it is not desirable.
[0023]It is preferred to provide a coating layer in one side or both sides of a white film of coating layer this invention. A coating layer is provided in order to improve the adhesive property of the white film of this invention, and the liquid crystal display parts pasted together, and the resin which does easy adhesiveness so can be used for it as the ingredient. As this resin, various resin of thermoplastics or thermosetting resin can use it. For example, they are polyester, polyamide, polyester amide, polyvinyl chloride, poly(meta) acrylic ester, polyurethane, polyvinyl chloride, polystyrene, polyolefines, these copolymers, and mixed material. Polyester, poly(meta) acrylic ester, and polyurethane are especially preferred. What added the cross linking agent and constructed the bridge may be used. As a solvent of a coating ointment, an organic solvent and mixtures, such as toluene, ethyl acetate, and methyl ethyl ketone, can be used, and also it is good also considering water as a solvent.
[0024]The coat which makes copolyester, polyalkylene oxide, and particles polyester film with the main ingredients in this invention may be laminated to one side or both sides of the outermost layer.
[0025]As an ingredient which forms a coat in this invention, other resin, such as melamine resin, a spray for preventing static electricity, colorant, a surface-active agent, etc. can be used in addition to the above-mentioned ingredient.
[0026]After applying the solution which contains the ingredient which forms a coat in the polyester film which can be extended, for example as a formation method of the above-mentioned coating layer, it can laminate by drying and extending and heat-treating if needed. The solids concentration of this solution is usually 30 or less % of the weight, and its 10 or less % of the weight is still more preferred.
[0027]The polyester film in which the above-mentioned extension is possible is unextended polyester film, uniaxial-stretching polyester film, or a biaxially oriented polyester film. Especially the vertical extension polyester film that carried out uniaxial stretching to the extruding direction (lengthwise direction) of this inner film is preferred.
[0028]When applying solution to polyester film, if it carries out by the usual coating process, i.e., the process separated from the manufacturing process of this film to the polyester film which

carried out biaxial-stretching heat setting, it is easy to involve in dust, dust, etc. and is not desirable. Spreading in an atmosphere cleaner than this viewpoint, i.e., spreading by the manufacturing process of a film, is preferred. And according to this spreading, the adhesion to the polyester film of a coat improves further.

[0029]As a coating method, the publicly known arbitrary methods of spreading are applicable. for example, the roll coat method, the gravure coating method, the roll brush method, a spray coating method, the air knife coat method, the impregnating method, the curtain coat method, etc. -- it can be independent, or it can combine and can use. As for coverage, per [it is running / 0.5-20g] 1 m of film ^{2}, and also 1-10g are preferred. As for aquosity liquid, it is preferred to use as a water dispersion or emulsified liquid.

[0030]The polyester film of manufacturing method this invention of a film can be manufactured using the film production method known from the former, such as the tenter method and a tubular film process. The biaxial-stretching method using the tenter as an example is explained below.

[0031]That is, the polyester composition containing a desired ingredient is heated, melt kneading is carried out with an extruder, it extrudes on the cooling drum which rotates from a slit shape die, and an unextended sheet is fabricated. This is succeedingly heated with roll heating, infrared heat, etc., it extends to a lengthwise direction, and a vertical oriented film is obtained. It is preferred to perform this extension using the peripheral speed difference of two or more rolls. As for extension temperature, it is preferred to consider it as a temperature higher than the glass transition point (Tg) of polyester and also a temperature higher 20-40 ** than Tg. Although draw magnification is based also on the demand characteristics of this use, it is preferred that it takes 2.5 or more times for 4.0 or less times. It is preferred preferably that it takes 2.8 or more times for 3.9 or less times. When the thickness spots of a film will worsen and a good film will not be obtained, if it is 2.5 or less times, but it is 4.0 or more times, it becomes easy to generate a fracture and there is a problem during film production.

[0032]Although a vertical oriented film continues, and processing of lateral orientation, heat setting, and heat relaxation is performed one by one and used as a biaxial oriented film, these processings are performed making it run a film. Processing of lateral orientation is begun from a temperature higher 20 ** than the glass transition point (Tg) of polyester. and the melting point (Tm) of polyester -- ** (120-30) -- it carries out, carrying out temperature up to a low temperature. As for this extension starting temperature, it is preferred that it is below ** (Tg+40). an extension maximum temperature -- Tm -- ** (100-40) -- it is preferred that it is a low temperature.

[0033]The temperature up in a lateral orientation process may be continuous, or gradual (successive) may be sufficient as it. Usually, temperature up is carried out sequentially. For example, the lateral orientation zone of a stenter is divided into plurality along a film running direction, and temperature up is carried out by pouring the heating medium of prescribed temperature for every zone. If lateral orientation starting temperature is too low, the tear of a film takes place and it is not desirable. If an extension maximum temperature is lower than ** (Tm-120), **** of a film will become large, and the homogeneity of crosswise physical properties falls, and it is not desirable. On the other hand, if an extension maximum temperature is higher than ** (Tm-30), a film will become soft, the tear of a film takes place by disturbance etc., and it is not desirable.

[0034]Although the magnification of lateral orientation is based also on the demand characteristics of this use, it is preferred that it takes 2.5 or more times for 4.0 or less times. It is preferred preferably that it takes 2.8 or more times for 3.9 or less times. When the thickness spots of a film will worsen and a good film will not be obtained, if it is 2.5 or less times, but it is 4.0 or more times, it becomes easy to generate a fracture and there is a problem during film production.

[Translation done.]

EXAMPLE

[Example]Hereafter, although this invention is explained in full detail according to an example, this invention is not limited only to these examples. Each weighted solidity was measured by the following methods.
[0036]1. It asked from the void fraction following formula.
(True density-real density) It calculates and asks for x100, in addition true density as titanium oxide density;3.9 and polyester polymer;1.4 (/true density). It asked for real specific gravity using the density gradient tube of a calcium nitrate.
[0037]2. Attach an integrating sphere to an average reflectance spectrophotometer (Shimadzu UV-3101PC), and measure reflectance when a $BaSO_4$ white sheet is made into 100% over 400-700 nm. From the obtained chart, reflectance was read at intervals of 5 nm, average value was calculated, and it was considered as average reflectance.
[0038]3. The integrating sphere was attached to the reflectance spectrophotometer (Shimadzu UV-3101PC), and the reflectance in 390 nm when a $BaSO_4$ white sheet is made into 100% was measured.
[0039]4. In the device shown in luminosity drawing 1 of a screen, after performing halftone dot printing to the acrylic board of 3-mm thickness and setting the film as the light reflector 2, it illuminated with the fluorescent lamp of 6W from the single-sided end face. Illumination is measured with an illuminometer (Minolta T-10), and let the Screen 1 top be a luminosity of a screen. Measurement of illumination attached what wound the black drawing paper of 20-mm width around the light-receiving child at the light-receiving child's size, and was used as the cylinder, and measured the distance of Screen 1 and a light-receiving child as 20 mm. The thing more than 1000 (Lx) was considered as success.
5. After setting the film as a light reflector of the device shown in amorous-glance drawing 1 of a screen, the amorous-glance screen of the screen was judged by visual appreciation, "yellow" and a reddish thing were made into "red" and the bluish thing was made [the thing of white light] into "blue" for "white" and a yellowish thing.
[0040][Examples 1-5 and comparative examples 1-4] Only the concentration shown in Table 1 was added, and titanium oxide, inorganic particle, and fluorescent brightener (Eastman alumnus-1) which are shown in Table 1 at polyethylene terephthalate were supplied to the extrusion machine heated by 280 **, and were fabricated from the dice to the sheet shaped. It led to the roll group which heated the unstretched film which furthermore carried out cooling solidification of this sheet on the cooling drum with a skin temperature of 25 ** at 85-98 **, extended for the magnification shown in Table 1 at a longitudinal direction (lengthwise direction), and cooled by a 25 ** roll group. Then, it extended for the magnification shown in Table 1 in the direction (transverse direction) vertical to the straight side in the atmosphere which led to the tenter and was heated by 120 **, holding with a clip the both ends of the film which carried out vertical extension. After that, 235 ** heat setting was performed, it cooled and rolled round to the room temperature after gradual cooling uniformly within the tenter, and the 125-micrometer-thick film was obtained. The physical properties as a liquid crystal display light reflector substrate of the obtained film are as in Table 2.

[0041][Example 6 and comparative example 5] Using two sets of extruders, from each extruder, add the particles shown in Table 1 to polyethylene terephthalate, and the extruder 1 B horizon, The extruder 2 was made into the A horizon, after drying like Example 1, it extruded, and the extruder 1 performed the inner layer and the extruder 2 performed the co-extrusion to 3 lamination of the outer layer. Then, 125 micrometers in thickness were obtained by the same technique as Example 1. The laminated constitution ratios of the obtained film were 1/11/1. The characteristic of the obtained film is as in Table 2.

[0042]

[Table 1]

		A層				B層					蛍光増白剤	縦延伸		横延伸	
		滑剤粒子		酸化チタン		無機粒子									
		種類	粒径 μm	濃度 重量%	粒径 μm	濃度 重量%	種類	粒径	濃度 重量%		濃度 重量%	温度 ℃	倍率	温度 ℃	倍率
実施例	1	なし			0.3	15	なし				0.10	110	3.5	120	3.6
	2	なし			0.3	25	なし				0.05	110	3.1	120	3.6
	3	なし			0.3	25	シリカ		5	0.3	0.03	110	3.1	120	3.5
	4	なし			0.3	25	シリカ		5	0.3	0.03	110	3.3	120	3.6
	5	なし			0.3	25	シリカ		5	0.3	なし	110	3.5	120	3.8
	6	酸化チタン		0.8	0.3	5	なし			0.01	なし	110	3.3	120	3.6
比較例	1	なし			0.3	14	なし				なし	110	3.4	120	3.5
	2	なし			0.3	14	なし				なし	110	3.6	120	3.9
	3	なし			0.3	45	なし				なし	製膜不可			
	4	なし			0.3	14	なし				0.10	110	3.4	120	3.5
	5	シリカ	4	12	0.3	10	シリカ		4	0.1	なし	110	3.4	120	3.5

[0043]
[Table 2]

		ボイド率 %	平均反射率 %	390nmでの反射率 %	画面の明るさ	画面の色目
実施例	1	3	91	85	1100	白
	2	12	93	88	1250	白
	3	15	94	89	1300	白
	4	20	96	90	1300	白
	5	22	96	91	1300	白
	6	12	90	75	1200	白
比較例	1	2.5	82	65	1000	黄
	2	3.5	91	70	1050	黄
	3	—	—	—		—
	4	2.5	85	78	950	白
	5	1.5	80	60	900	黄

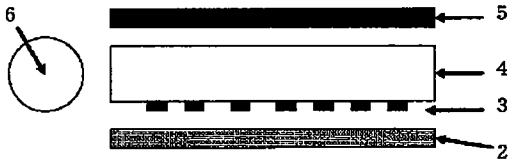
[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]Drawing 1 is a sectional view of a liquid crystal display.
[Description of Notations]
1 Screen
2 Light reflector
3 Halftone dot printing
4 Transparent light guide plate
5 Diffusion board
6 Cold cathode tube (fluorescent lamp)

[Translation done.]

Drawing selection Drawing 1



[Translation done.]

(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号
特開2002－138150
（P2002－138150A）
(43)公開日　平成14年５月14日(2002.5.14)

(51)Int.Cl.⁷		識別記号	FI		テーマコード（参考）
Ｃ０８Ｊ	5/18	ＣＦＤ	Ｃ０８Ｊ　5/18	ＣＦＤ	２Ｈ０４２
Ｂ３２Ｂ	27/36		Ｂ３２Ｂ　27/36		２Ｈ０９１
Ｃ０８Ｋ	3/00		Ｃ０８Ｋ　3/00		４Ｆ０７１
	3/22		3/22		４Ｆ１００
	5/00		5/00		４Ｊ００２

審査請求　未請求　請求項の数６　ＯＬ　（全　８　頁）　最終頁に続く

(21)出願番号　特願2000－335917(P2000－335917)
(22)出願日　平成12年11月２日(2000.11.2)

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(54)【発明の名称】　白色ポリエステルフィルム

(57)【要約】
【課題】　酸化チタンを用いてもより高反射率で、より明るい画面が得られる、液晶ディスプレイ反射板用基材に用いて最適な液晶ディスプレイ反射板用白色ポリエステルフィルムを提供する。
【解決手段】　平均粒径０．１～０．５μｍの酸化チタンを１５～４０重量％含有し、ボイド率が３～２５％、４００～７００ｎｍの光の波長域における平均反射率が９０％以上、かつ３９０ｎｍの光の波長での反射率が７５％以上であることを特徴とする白色ポリエステルフィルム。

1

【特許請求の範囲】

【請求項１】　平均粒径０．１～０．５μmの酸化チタンを１５～４０重量％含有し、ボイド率が３～２５％、４００～７００ｎmの光の波長域における平均反射率が９０％以上、かつ３９０ｎmの光の波長での反射率が７５％以上であることを特徴とする白色ポリエステルフィルム。

【請求項２】　酸化チタンに加え、さらに蛍光増白剤を０．０１～０．２重量％含有する請求項１記載の白色ポリエステルフィルム。

【請求項３】　酸化チタンに加え、さらに酸化チタン以外の粒子を５重量％以下含有する請求項１または２記載の白色ポリエステルフィルム。

【請求項４】　白色ポリエステルフィルムの片面または両面に、滑剤粒子を０．０１～１０重量％含有するポリエステルからなる層を積層した請求項１記載の白色ポリエステルフィルム。

【請求項５】　白色ポリエステルフィルムの片面または両面に、コーティング層を積層した請求項１記載の白色ポリエステルフィルム。

【請求項６】　液晶ディスプレイ反射板基材として用いる請求項１～５のいずれかに記載の白色ポリエステルフィルム。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、白色ポリエステルフィルムに関し、詳しくは液晶ディスプレイ用の反射板用基材に最適な白色ポリエステルフィルムに関し、さらに詳しくは液晶画面をライトにより照明した場合、より明るい画面が得られる反射板用基材を構成することが可能な液晶ディスプレイ反射板に用いる白色ポリエステルフィルムに関する。

【０００２】

【従来の技術】液晶ディスプレイを照明する際に、従来、ディスプレイの背面からライトを当てるバックライト方式が採用されていたが、近年、特開昭６３－６２１０４号公報に示されるようなサイドライト方式が、薄型で均一に照明できるメリットから、広く用いられるようになってきた。サイドライト方式とは、ある厚みを持ったアクリル板などのエッジから冷陰極管などを用い照明する方式である。この方式によると、液晶ディスプレイ内部に設けられた網点印刷により、照明光が均一に分散され、均一な明るさをもった画面が得られる利点がある。また、画面の背面でなく、エッジ部に照明を設置するため、バックライト方式より薄型に出来る利点もある。なお、液晶ディスプレイ内部には、照明光の画面背面への逃げを防ぐため、画面の背面に反射板が設置されている。この構成において、より明るい画面が得られるようにするには、反射板の薄膜化と、光の高反射性が要求される。

2

【０００３】この目的に沿う液晶ディスプレイ反射板用白色ポリエステルフィルムとして、例えば作業性の容易さや安価なことから酸化チタンを含有せしめる方法が挙げられるが、特公平８－１６１７５号公報に記載されているように酸化チタンなどの添加だけでは反射率向上には限界があり、画面の明るさが十分でないという問題があった。

【０００４】

【発明が解決しようとする課題】本発明は、かかる問題点を解決し、酸化チタンを用いてもより高反射率で、より明るい画面が得られる、液晶ディスプレイ反射板用基材に用いて最適な液晶ディスプレイ反射板用白色ポリエステルフィルムを提供することを目的とする。

【０００５】

【課題を解決するための手段】本発明者らは、前記の液晶ディスプレイ反射板用白色ポリエステルフィルムを開発すべく鋭意検討した結果、本発明に到達した。すなわち、本発明は、平均粒径０．１～０．５μmの酸化チタンを１５～４０重量％含有し、ボイド率が３～２５％、４００～７００ｎmの光の波長域における平均反射率が９０％以上、かつ３９０ｎmの光の波長での反射率が７５％以上であることを特徴とする白色ポリエステルフィルムである。

【０００６】また、本発明の白色ポリエステルフィルムは、以下の態様をとることが好ましい。

１．酸化チタンに加え、さらに蛍光増白剤を０．０１～０．２重量％含有する。

２．酸化チタンに加え、さらに酸化チタン以外の粒子を５重量％以下含有する。

３．白色ポリエステルフィルムの片面または両面に、滑剤粒子を０．０１～１０重量％含有するポリエステルからなる層を積層する。

４．白色ポリエステルフィルムの片面または両面に、コーティング層を積層する。

【０００７】

【発明の実施の形態】以下、本発明を詳細に説明する。

【０００８】ポリエステル

本発明のフィルムを構成するポリエステルとしては、ジオールとジカルボン酸を縮重合反応させて得られるポリマーであり、ジカルボン酸としては、例えばテレフタル酸、イソフタル酸、２，６－ナフタリンジカルボン酸、４，４’－ジフェニルジカルボン酸、アジピン酸、セバシン酸等が好ましく用いられ、またジオールとは、例えばエチレングリコール、１，４－ブタンジオール、１，４－シクロヘキサンジメタノール、１，６－ヘキサンジオール等が好ましく用いられる。これらの中、ポリエチレンテレフタレート、ポリエチレン－２，６－ナフタレンジカルボキシレートが特に好ましい。また、これらポリエステルはホモポリエステルであっても、共重合ポリエステルであっても良い。共重合成分としては、例えば

ジエチレングリコール、ネオペンチルグリコール、ポリアルキレングリコールなどのジオール成分、アジピン酸、セバシン酸、フタル酸、イソフタル酸、２，６－ナフタレンジカルボン酸、５－ナトリウムスルホイソフタル酸などのジカルボン酸成分があげられる。

【０００９】また、このポリエステルの中には公知の各種添加剤、たとえば、酸化防止剤、帯電防止剤などが添加されていても良い。本発明におけるポリエステルとしては、ポリエチレンテレフタレートが好ましい。ポリエチレンテレフタレートは耐水性、耐久性、耐薬品性などに優れているものである。

【００１０】添加粒子

本発明の白色フィルムは、平均粒径０．１～０．５μｍの酸化チタン粒子を１５～４０重量%、好ましくは２０～３５重量%の範囲含有する。含有量が１５重量%未満だと４００～７００ｎｍの光の波長域での平均反射率が９０%に到達せず、一方４０重量%を超えると延伸性の劣ったものとなり、フィルム製膜時の生産効率が著しく悪くなる。

【００１１】また、本発明の白色フィルムは、酸化チタン以外の粒子を、５重量%以下含有することが好ましい。５重量%を超えると延伸性が劣り生産性の悪いものとなる。上記粒子としては、蛍光増白剤の効果を妨げないために、光の吸収のない粒子が好ましい。また、ボイドの形成しやすい粒子がより好ましい。これら粒子としてたとえば、シリカ、炭酸カルシウム、アルミナ、燐酸カルシウム、タルク、クレー、硫酸バリウムなどの不活性無機粒子、シリコーン、架橋ポリスチレン、スチレン－ジビニルベンゼン共重合体のような有機粒子を好ましく挙げることが出来る。

【００１２】酸化チタン粒子、酸化チタン以外の粒子は、ポリエステルへ添加含有させる前に、精製プロセスを用いて、粒径調整、粗大粒子除去を行うことが好ましい。生成プロセスの工業的手段としては、粉砕手段として例えばジェットミル、ボールミル等が挙げられ、また分級手段として例えば乾式もしくは湿式遠心分離機等が挙げられる。なお、これらの手段は２種以上を組み合わせ、段階的に精製しても良いのはもちろんである。

【００１３】また、ポリエステルに粒子を含有させる方法としては各種の方法を用いることが出来る。その代表的な方法として、下記のような方法を挙げることが出来る。

（ア）ポリエステル合成時のエステル交換反応もしくはエステル化反応終了前に添加、もしくは重縮合反応開始前に添加する方法。

（イ）ポリエステルに添加し、溶融混練する方法。

（ウ）上記（ア）、（イ）の方法において酸化チタンや他の滑剤を多量添加したマスターペレットを製造し、これら添加剤を含有しないポリエステルと混練し、所定量の添加物を含有させる方法。

【００１４】なお、前記（ア）のポリエステル合成時に添加する方法を用いる場合には、粒子をグリコールに分散したスラリーとして、反応系に添加することが好ましい。

【００１５】ポリエステルフィルム

本発明のポリエステルフィルムは、ボイド率が２．５～２５%、好ましくは３～２０%の範囲であることが好ましい。なお、ボイド率は、フィルム中のボイド（空隙）の多さを表したもので、このボイドの存在によりフィルムに入射された光がフィルムポリマーと空気との界面で反射を起こし、フィルムの反射率の向上に効果をもたらすものと推定される。ボイド率が３%未満だと４００～７００ｎｍの光の波長域における平均反射率が低下し、一方、２５%を超えるものはフィルムの延伸が難しくなり、生産効率が著しく悪くなる。

【００１６】フィルム内部にボイドを形成させるには、フィルム母材、たとえばポリエステル中に、高融点の非相溶ポリマーを細かく分散させ、それを延伸することにより達成される。延伸は、一軸でも良いが好ましくは二軸延伸である。延伸に際して、非相溶ポリマー粒子周りにボイドが形成され、より高反射率を得ることが可能となる。非相溶ポリマーとしては、ポリ－３－メチルブテン－１、ポリ－４－メチルペンテン－１、ポリビニル－ｔ－ブタン、１，４－トランス－ポリ－２，３－ジメチルブタジエン、ポリビニルシクロヘキサン、ポリスチレン、ポリメチルスチレン、ポリジメチルスチレン、ポリフルオロスチレン、ポリ－２－メチル－４－フルオロスチレン、ポリビニル－ｔ－ブチルエーテル、セルロールトリアセテート、セルロールトリプロピオネート、ポリビニルフルオライド、ポリクロロトリフルオロエチレンなどが挙げられる。中でも、ポリオレフィン、特にポリ－４－メチルペンテン－１が好ましい。

【００１７】上記以外のボイド形成手段を用いてもよい。例えば炭酸ナトリウムや炭酸カリウムなどの炭酸塩からなる発泡剤を加え、発泡形性せしめる方法（特公昭５８－５０６２４号公報）や、クエン酸、クエン酸トリエチル、クエン酸ナトリウム、クエン酸カルシウム、トリカルバリル酸、トリカルバリル酸ナトリウム、トリカルバリル酸カルシウム、エタントリカルボン酸トリエチル、エタントリカルボン酸ナトリウム、メタントリカルボン酸トリエチル、メタントリカルボン酸ナトリウム、ブタントリカルボン酸トリエチル、ブタントリカルボン酸ナトリウム、ブタンテトラカルボン酸などであり、これらの発泡剤単独もしくはこれらの発泡剤を複数混合しても良い。また、必要に応じて発泡助剤を添加してもよく、発泡助剤としては炭素数が１０以上の脂肪族モノカルボン酸のＣａ塩、Ｚｎ塩、Ｍｇ塩、Ｎａ塩、Ａｌ塩、Ｐｂ塩およびＭｎ塩、ならびに炭素数が１０以上の脂肪族モノカルボン酸のエステルよりなる群から選ばれる化合物が好ましく、これら発泡助剤を２種以上併用しても

良い。発泡助剤の添加量はフィルムの物性に影響しない程度であり、０．０１～５重量％が好ましい。

【００１８】また、ポリエチレンテレフタレートとポリカーボネートとの均一な混合物を２５０～３５０℃の温度に加熱、反応させ、CO_2が遊離するまでその加熱温度に保ち、その後に反応混合物を膨張させる方法（特公昭４７－３８８７５号公報）、あるいは水添加や超臨海流体を溶融ポリマーに添加する物理的発泡手段を用いても構わない。

【００１９】本発明のフィルムは、単層フィルムであってもよいし、積層フィルムであってもよい。積層フィルムとしては、白色ポリエステルフィルムの片面または両面にポリエステルからなる層を積層した構成が好ましく挙げられる。前記ポリエステルからなる層は、滑剤粒子を０．０１～１０重量％含有することが好ましい。滑剤粒子の種類と平均粒径は、前述の酸化チタン以外の粒子に準じる。

【００２０】本発明のフィルムの厚みは、全体で１０～３００μm、好ましくは１２～２５０μm、更に好ましくは１３～１８８μmである。積層フィルムの場合、各層の厚み比は、（ポリエステルからなる層）／（白色ポリエステルフィルム層）＝０．０１～３の範囲が好ましい。

【００２１】蛍光増白剤

本発明のポリエステルフィルムは、蛍光増白剤を０．０１～０．２重量％の範囲、好ましくは０．０１～０．１重量％の範囲含有していることが好ましい。蛍光増白剤の種類としては、ＯＢ－１（イーストマン社製）、Ｕｖｉｔｅｘ－ＭＤ（チバガイギー社製）、ＪＰ－Ｃｏｎｃ（日本化学工業所製）などがあげられる。

【００２２】蛍光増白剤の添加量が０．０１重量％未満では、３９０ｎｍの光の波長域の反射率が上記反射率より下まわり反射板とした時に照度が十分なものとならない。０．２重量％を超えると、蛍光増白剤の持つ特有の色が現れてしまうため好ましくない。

【００２３】コーティング層

本発明の白色フィルムの片面または両面にコーティング層を設けることが好ましい。コーティング層は、本発明の白色フィルムと貼合せられる液晶ディスプレイ部品との接着性を改善するために設けられるもので、その成分としては易接着性を奏する樹脂を用いることができる。この樹脂としては、熱可塑性樹脂または熱硬化性樹脂の各種樹脂が使用し得る。たとえば、ポリエステル、ポリアミド、ポリエステルアミド、ポリ塩化ビニル、ポリ（メタ）アクリル酸エステル、ポリウレタン、ポリ塩化ビニル、ポリスチレン、ポリオレフィンや、これらの共重合体やブレンド物である。なかでもポリエステル、ポリ（メタ）アクリル酸エステル、ポリウレタンが好ましい。更に架橋剤を加えて架橋したものでも良い。コーティング塗剤の溶媒としては、トルエン、酢酸エチル、メチルエチルケトンなどの有機溶媒および混合物が使用でき、更に水を溶媒としてもよい。

【００２４】また、本発明においてはポリエステルフィルムにコポリエステル、ポリアルキレンオキサイドおよび微粒子を主成分とする塗膜を最外層の片面または両面に積層してもよい。

【００２５】本発明においては塗膜を形成する成分として、上記成分以外にメラミン樹脂等の他の樹脂、帯電防止剤、着色剤、界面活性剤等を使用することが出来る。

【００２６】上記コーティング層の形成方法としては、例えば延伸可能なポリエステルフィルムに塗膜を形成する成分を含む水溶液を塗布した後、乾燥、延伸し必要に応じて熱処理することにより積層することが出来る。この水溶液の固形分濃度は、通常３０重量％以下であり、１０重量％以下が更に好ましい。

【００２７】上記の延伸可能なポリエステルフィルムとは、未延伸ポリエステルフィルム、一軸延伸ポリエステルフィルムまたは二軸延伸ポリエステルフィルムである。この内フィルムの押出し方向（縦方向）に一軸延伸した縦延伸ポリエステルフィルムが特に好ましい。

【００２８】水溶液をポリエステルフィルムに塗布する場合、通常の塗工工程、すなわち二軸延伸熱固定したポリエステルフィルムに該フィルムの製造工程と切り離した工程で行うと埃、ちり等を巻き込み易く好ましくない。かかる観点よりクリーンな雰囲気での塗布、すなわちフィルムの製造工程での塗布が好ましい。そして、この塗布によれば、塗膜のポリエステルフィルムへの密着性が更に向上する。

【００２９】塗布方法としては、公知の任意の塗布方が適用できる。例えばロールコート法、グラビアコート法、ロールブラッシュ法、スプレーコート法、エアーナイフコート法、含浸法およびカーテンコート法などを単独または組み合わせて用いることが出来る。塗布量は走行しているフィルム１m^2当たり０．５～２０ｇ、更に１～１０ｇが好ましい。水性液は水分散液または乳化液として用いるのが好ましい。

【００３０】フィルムの製造方法

本発明のポリエステルフィルムは、テンター法、インフレーション法等の従来より知られている製膜方法を用いて製造することができる。例として、テンターを用いた二軸延伸法について以下に説明する。

【００３１】すなわち、所望の成分を含有するポリエステル組成物を加熱し、押出し機で溶融混練し、スリット状のダイから回転する冷却ドラムの上に押出し、未延伸シートを成形する。引き続きこれをロール加熱、赤外線加熱等で加熱し、縦方向に延伸して縦延伸フィルムを得る。この延伸は２個以上のロールの周速差を利用して行うのが好ましい。延伸温度はポリエステルのガラス転移点（Ｔｇ）より高い温度、更にはＴｇより２０～４０℃高い温度とするのが好ましい。延伸倍率は、この用途の

要求特性にもよるが、２．５倍以上４．０倍以下とするのが好ましい。更に好ましくは、２．８倍以上３．９倍以下とするのが好ましい。２．５倍以下とするとフィルムの厚み斑が悪くなり良好なフィルムが得られず、４．０倍以上とすると製膜中に破断が発生し易くなり問題がある。

【００３２】縦延伸フィルムは、続いて、横延伸、熱固定、熱弛緩の処理を順次施して二軸配向フィルムとするが、これら処理はフィルムを走行させながら行う。横延伸の処理はポリエステルのガラス転移点（Ｔｇ）より２０℃高い温度から始める。そしてポリエステルの融点（Ｔｍ）より（１２０～３０）℃低い温度まで昇温しながら行う。この延伸開始温度は（Ｔｇ＋４０）℃以下であることが好ましい。また延伸最高温度はＴｍより（１００～４０）℃低い温度であることが好ましい。

【００３３】横延伸過程での昇温は連続的でも段階的（逐次的）でもよい。通常逐次的に昇温する。例えばステンターの横延伸ゾーンをフィルム走行方向に沿って複数に分け、各ゾーンごとに所定温度の加熱媒体を流すことで昇温する。横延伸開始温度が低すぎるとフィルムの破れが起こり、好ましくない。また延伸最高温度が（Ｔｍ－１２０）℃より低いとフィルムの熱収が大きくなり、また幅方向の物性の均一性が低下し、好ましくない。一方延伸最高温度が（Ｔｍ－３０）℃より高いとフィルムが柔らかくなり外乱等によってフィルムの破れが起こり、好ましくない。

【００３４】横延伸の倍率は、この用途の要求特性にもよるが、２．５倍以上４．０倍以下とするのが好ましい。更に好ましくは、２．８倍以上３．９倍以下とするのが好ましい。２．５倍以下とするとフィルムの厚み斑が悪くなり良好なフィルムが得られず、４．０倍以上とすると製膜中に破断が発生し易くなり問題がある。

【００３５】

【実施例】以下、実施例により本発明を詳述するが、本発明はこれらの実施例のみに限定されるものではない。なお、各特性値は以下の方法で測定した。

【００３６】１．ボイド率

下記式から求めた。

（（真密度－実密度）／真密度）×１００

なお、真密度は、酸化チタン密度；３．９、ポリエステルポリマー；１．４として、計算して求める。実比重は、硝酸カルシウムの密度勾配管を用いて求めた。

【００３７】２．平均反射率

分光光度計（島津製作所製ＵＶ－３１０１ＰＣ）に積分球を取り付け、$BaSO_4$白板を１００％とした時の反射率を４００～７００ｎｍにわたって測定する。得られたチャートより５ｎｍ間隔で反射率を読み取り、平均値を計算し、平均反射率とした。

【００３８】３．反射率

分光光度計（島津製作所製ＵＶ－３１０１ＰＣ）に積分球を取り付け、$BaSO_4$白板を１００％とした時の３９０ｎｍでの反射率を測定した。

【００３９】４．画面の明るさ

図１に示す装置において、３ｍｍ厚さのアクリル板に網点印刷を施し、反射板２としてフィルムをセットした上で、片側端面から６Ｗの蛍光灯により照明した。画面１上を照度計（ミノルタ　Ｔ－１０）にて照度を測定し、画面の明るさとする。照度の測定は受光子に２０ｍｍ幅の黒画用紙を受光子の大きさに巻いて円筒としたものを取り付け、画面１と受光子の距離を２０ｍｍとして測定した。１０００（Ｌｘ）以上のものを合格とした。

５．画面の色目

図１に示す装置の反射板としてフィルムをセットしたうえで、画面の色目画面を視感で判断し、白色光のものを「白」、黄味がかっているものを「黄」、赤味がかっているものを「赤」、青味がかっているものを「青」とした。

【００４０】［実施例１～５および比較例１～４］ポリエチレンテレフタレートに表１に示す酸化チタンおよび無機粒子および蛍光増白剤（イーストマン社製ＯＢ－１）を表１に示す濃度だけ添加し、２８０℃に加熱された押出機に供給し、ダイスよりシート状に成形した。さらにこのシートを表面温度２５℃の冷却ドラムで冷却固化した未延伸フィルムを８５～９８℃に加熱したロール群に導き、長手方向（縦方向）に表１に示す倍率で延伸し、２５℃のロール群で冷却した。続いて、縦延伸したフィルムの両端をクリップで保持しながらテンターに導き１２０℃に加熱された雰囲気中で長手に垂直な方向（横方向）に表１に示す倍率で延伸した。その後テンター内で２３５℃の熱固定を行い、均一に除冷後、室温まで冷やして巻取り、厚み１２５μｍのフィルムを得た。得られたフィルムの液晶ディスプレイ反射板基材としての物性は表２の通りである。

【００４１】［実施例６および比較例５］２台の押出し機を用い、各々の押出し機よりポリエチレンテレフタレートに表１に示す粒子を添加し押出し機１をＢ層、押出し機２をＡ層とし、実施例１のように乾燥した上で押出し、押出し機１が内層、押出し機２が外層の３層構成に共押出しを行った。その後、実施例１と同様の手法で厚み１２５μｍを得た。得られたフィルムの積層構成比率は、１／１１／１であった。得られたフィルムの特性は表２の通りである。

【００４２】

【表１】

【００４３】
【表２】

		A層			B層									
		滑剤粒子			酸化チタン		無機粒子			蛍光増白剤	縦延伸		横延伸	
		種類	粒径 μm	濃度 重量％	粒径 μm	濃度 重量％	種類	粒径	濃度 重量％	濃度 重量％	温度 ℃	倍率	温度 ℃	倍率
実施例	1	なし			0.3	15	なし			0.10	110	3.5	120	3.6
	2	なし			0.3	25	なし			0.05	110	3.1	120	3.6
	3	なし			0.3	25	シリカ	5	0.3	0.03	110	3.1	120	3.5
	4	なし			0.3	25	シリカ	5	0.3	0.03	110	3.3	120	3.6
	5	なし			0.3	25	シリカ	5	0.3	なし	110	3.5	120	3.6
	6	酸化チタン	0.3	5	0.3	25	なし			0.01	110	3.3	120	3.6
比較例	1	なし			0.3	14	なし			なし	110	3.4	120	3.5
	2	なし			0.3	14	なし			なし	110	3.6	120	3.9
	3	なし			0.3	45	なし			なし	製膜不可			
	4	なし			0.3	14	なし			0.10	110	3.4	120	3.5
	5	シリカ	4	12	0.3	10	シリカ	4	0.1	なし	110	3.4	120	3.5

		ボイド率 %	平均反射率 %	390nmでの反射率 %	画面の明るさ	画面の色目
実施例	1	3	91	85	1100	白
	2	12	93	88	1250	白
	3	15	94	89	1300	白
	4	20	98	90	1300	白
	5	22	96	91	1300	白
	6	12	90	75	1200	白
比較例	1	2.5	82	65	1000	黄
	2	3.5	91	70	1050	黄
	3	－	－	－	－	－
	4	2.5	85	78	950	白
	5	1.5	80	60	900	黄

【００４４】

【発明の効果】本発明によれば、酸化チタンを用いてもより高反射率で、より明るい画面が得られる、液晶ディスプレイ反射板用基材に用いて最適な液晶ディスプレイ反射板用白色ポリエステルフィルムを得ることが可能となり、その工業的価値は高い。

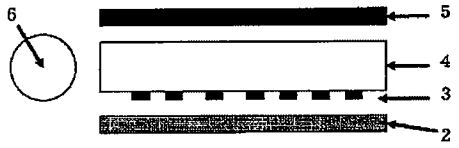
【図面の簡単な説明】

【図１】図１は液晶ディスプレイの断面図である。　＊

＊【符号の説明】

1　画面
2　反射板
3　網点印刷
4　透明導光板
5　拡散板
6　冷陰極管（蛍光灯）

【図１】



フロントページの続き

(51)Int.Cl.[7]	識別記号	F I		テーマコード(参考)
C08L	67/02	C08L	67/02	
G02B	1/04	G02B	1/04	
	5/02		5/02	B
G02F	1/13357	G02F	1/1335	530

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Ｆターム(参考) 2H042 BA02 BA15 BA20
2H091 FA16Z FB02 FB13 FC09
LA30
4F071 AA43 AA45 AA46 AB17 AE17
AE22 AF29Y AF53Y AH16
BA01 BB06 BB08 BC01
4F100 AA20A AA21A AA21B AA21C
AA21H AK41A AK41B AK41C
AK42A AK42B AK42C BA03
BA05 BA06 BA10B BA10C
BA10D BA10E CA13A CA19B
CA19C CA30A CC00D CC00E
DE01A GB41 JA13A JL10A
JN06 JN06A YY00A YY00B
YY00C
4J002 CF041 CF051 CF061 CF081
DE136 GP00

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Grasp the Idea
Expand the Idea
Describe the Idea
and
Protect the Idea

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June 15, 2009

VIA FACSIMILE

2 page(s) (including this page)

CONFIRMATION COPY

Mr. Christopher L. Frank
Darby & Darby P.C.
7th World Trade Center
250 Greenwih St.
New York, NY 10007-0042, U.S.A.

Re: U.S. Serial No.: 10/595,393 (PCT/JP2004/015047)
Applicant: MITSUBISHI PLASTICS, INC.
Your ref.: 20570/0204294-US0
Our ref.: FP301US

Dear Mr. Frank:

We are enclosing copies of one (1) reference cited in an Office Action issued by the JPO, with mailing date of March 17, 2009, in a counterpart JP application of the above-identified application.

Please submit the reference to the USPTO as additional IDS.

Please acknowledge your safe receipt of the reference.

Very truly yours,

Yumiko Oshima

Yumiko OSHIMA (Ms.)
YO/ni
Enclosures: Via courier

RECEIVED DARBY & DARBY P.C.
BY: J. Harada
PATENT SERVICES DEPT.
DATE: 6/16/09